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AUTHOR Casten, Robin J.; And Others
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ABSTRACT

To extend previous research on adolescent temperament, this study developed and tested the Adolescent Temperament Questionnaire (ATQ), a 70-item self-report questionnaire which used a Likert-like scale and a wider array of items than used in previous assessment instruments. The study examined the conceptual fit of higher order structures of temperament to models of adult personality. These structures were based on an earlier study of infant development in which it was proposed that temperament consists of nine distinct dimensions including sensory threshold, intensity of mood expression, distractibility, persistence, adaptability, approach/withdrawal from new situations, regularity of biological functions, activity level, and positive and negative mood. The ATQ was administered to 436 students in middle and senior high school. Results of a factor analysis suggested that the structure of temperament in adolescence is multidimensional, although comprised of highly related factors. Moderately strong relations between first-order factors that tapped the second-order factors of Diligence and Sociability were found. Second-order constructs were moderately associated, suggesting substantial overlap among the behavioral styles they represented. Finally, factor loadings for Intensity, Threshold, and Distractibility were relatively low, indicating a lack of conceptual purity in these dimensions. (MM)

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# A Confirmatory Factor Analysis of the Structure of Temperament in Adolescence

Robin J. Casten

Department of Educational Psychology

Lawrence M. Scheier

Division of Clinical Psychology

William Fullard

Department of Educational Psychology

Temple University

Paper presented at the biannual meeting of the Society for Research in Child Development, New Orleans, LA, March, 1993

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This research was supported in part by a grant to Barbara Schraeder by the National Institute of Mental Health (RD1315-7). Address correspondence and reprint requests to: Robin J. Casten, Temple University, Department of Educational Psychology, Ritter Annex-004-00, Philadelphia, PA 19122.

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A Confirmatory Factor Analysis of the Structure of Temperament in Adolescence

Temperament has long been recognized as an important component of socioemotional development in early life. Current conceptualizations of temperament are primarily based on the pioneering work of Thomas and Chess (1977). Based on their New York Longitudinal Study of infant development, they emphasized that temperament refers to the behavioral style or *"how"* of behavior, rather than motivational or ability-related causes. Accordingly, Thomas and Chess proposed that temperament consists of nine distinct dimensions including: sensory threshold, intensity of mood expression, distractibility to extraneous stimuli, persistence with difficult tasks, adaptability to the requirement of change, approach/withdrawal from new situations, demands or environments, regularity of biological functions, activity level, and positive and negative mood. In sum, a large part of their research underscored the clinical utility of temperament and its linkages with a host of psychological measures. In recent years, their research has actively stimulated the development of numerous psychometric assessments of temperament appropriate for both infancy and childhood.

Notwithstanding, the literature is sparse regarding the appropriateness of applying models of temperament to adolescence and beyond. Adolescence represents an important developmental bridge between childhood and young adulthood. Several developmental changes occur during this period, many of which may influence behavioral styles. Adolescence is a period marked by the onset of formal operations, egocentric thinking, rapid physical growth, and individuation of the self. While many have viewed this portion of the lifespan as remarkably

stressful (Hall, 1904), others have regarded these developmental milestones as indicative of ego crystallization and identity formation (Erikson, 1968). Given the tendency during this age period toward unification of behavioral styles into a more coherent self, an important question is whether models of temperament, which favor distinct (i.e., orthogonal) stylistic components are appropriate for characterizing adolescent temperament.

Additionally, a recent literature examining self-rated adult mood provides evidence that mood is best conceptualized as bidimensional, consisting of positive and negative affect, rather than unidimensional or bipolar (Warr, Barter, & Brownbridge, 1983; Watson & Tellegen, 1985; Watson, Clark, & Tellegen, 1988). While these results are primarily based on adult samples, little empirical support has been garnered for a similar bidimensional structure in younger ages. Third, there is a growing debate regarding the importance of temperament as a precursor of personality in adulthood. Conceptual maps between these seemingly disparate camps have been extended theoretically, but rarely have these linkages been tested empirically (Buss & Plomin, 1975; 1984).

To address these concerns we extend previous research by: (1) hypothesizing that mood is best conceptualized as two distinct dimensions; consisting of both positive (i.e., carefree, excited, lively) and negative affect (i.e., nervous, anxious, angry); (2) testing both correlated and orthogonal models of temperament; (3) using a wider array of items than previous assessments; and (4) testing higher-order structures of temperament for their conceptual fit to models of adult personality. Finally, we used latent-variable confirmatory factor analysis (CFA) to contrast several competing models, evaluating their

conceptual efficiency through a series of nested hierarchical tests (EQS: Bentler, 1989).

## Methods and Results

The Adolescent Temperament Questionnaire (ATQ) is a 70-item self-report questionnaire primarily based on Thomas and Chess's nine dimensions. Items are scaled on a 4-point Likert scale and ranged from "never" (1) to "always" (4), with the exception of the mood items, which were scored from "never true" (1) to "always true" (4). Data were obtained from 436 students in middle and senior high school. Fifty-five percent of the students were male, the racial composition was predominantly white and ranged in age from 12 to 18 years of age.

A latent-variable CFA was conducted using the EQS statistical program (Bentler, 1989). We adhered to a two-step approach including fine-tuning the CFA model through both unrestricted (exploratory) and "restricted" (confirmatory) analyses (Anderson & Gerbing, 1988). Overall, we hypothesized nine latent constructs based on Thomas and Chess, with the addition of a tenth latent factor consistent with the notion that mood is best conceptualized as bidimensional. Item factor configurations are contained in Figure 1, which also depicts the standardized factor loadings from the 10-dimensional model. As depicted, all factor loadings were significant and moderately large. Factor intercorrelations from the 10-factor model are contained in Table 1. Negative and positive mood were significantly and moderately correlated (-.33). By several criteria the model fit well, [$X^2$ (1179, 436) = 2404.4, $X^2$/df = 2.04] and accounted for 72% of the covariation (Bentler, 1990). By comparison, the correlated model showed a significant improvement over the correlated model [difference $X^2$ (52,

436) = 664.12, $p < .001$], and a substantial increment in the amount of covariation accounted for in the sample data by the hypothesized model (72% for the correlated vs. 54% for the orthogonal model).

Given the large associations among several first-order constructs, we also tested a second-order structure. We specified two second-order factors: "Diligence" hypothesized to cause the associations between Distractability and Persistence; and "Sociability", hypothesized to cause the associations between Positive Mood, Adaptability, and Approach/Withdrawal. The remaining first-order constructs correlated freely among themselves and between the second-order constructs. Figure 2 depicts the second-order factor structure and contains the standardized factor loadings and factor intercorrelations [$X^2$ (1198, 436) = 2473.61; CFI=.71]. A nested chi-square test indicated a slight statistical superiority of the second-order model over the primary structure, however, there was little gain in explanatory power [difference-$X^2$ (19, 436) = 69.21, $p < .001$].

## Discussion

These results suggest that the structure of temperament in adolescence is multidimensional, although comprised of highly related factors. Some clarification is needed regarding the nature of the interrelations among dimensions. We found moderately strong relations between factors which tapped Diligence and likewise between those tapping Sociability and modeled these accordingly as second-order constructs. Moreover, the second-order constructs were moderately associated suggesting substantial overlap among these behavioral styles. Based on their clinical observations, Thomas and Chess (1977) suggested three clinically meaningful constellations, or

aggregate behavioral styles, one of which included the "easy child". Easy children were characterized as flexible, approachable, regular in bodily functions, adaptable, and mildly intense in (positive) mood.

Our results suggest a similar pattern persisting in adolescence, although with some conceptual refinement. What may appear much earlier in life as "easy" behavioral styles (relative to the management and care of infants) manifests itself in older aged youth as lack of distractibility, persistence with respect to task completion, adaptability to new situations/people, willingness to engage in social situations, and positive mood (i.e., lively, carefree, and content). Likewise, the distinction between positive and negative affectivity presages an important development in affective systems, one which may potentiate distinctions along several dimensions of personality including neurotic, surgent, or extraverted.

Finally, factor loadings for Intensity, Threshold, and Distractability were relatively low, indicating a lack of conceptual purity in these dimensions. Refinement of these dimensions for older aged samples may need to incorporate distinctions between cognitive and emotion-focused behavioral styles, as well as sensory versus situation-specific temperamental traits. Future studies of adolescent temperament may want to adopt a more age-specific approach that includes differentiation between general and situational styles.

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## Figure Captions

Figure 1. Confirmatory factor analysis model (CFA) depicting 10-factor model of temperament. Large circles are latent constructs, rectangles are measured variables. Small circles with unidirectional arrows are residual variables (variances). Parameter estimates are standardized and significance levels are based on critical ratios. [a=p<.05; b=p<.01; c=p<.001].

Figure 2. CFA model depicting second-order latent constructs of Diligence and Sociability, and first-order constructs of Rhythmicity, Intensity, Threshold, Activity, and Negative Mood. Large circles with bold typeface depict higher-order constructs, while small circles are disturbance variables (variances). Measured variables have not been included in figure for purposes of clarity, but can be found in Figure 1. [a=p<.05; b=p<.01; c=p<.001].

Table 1.

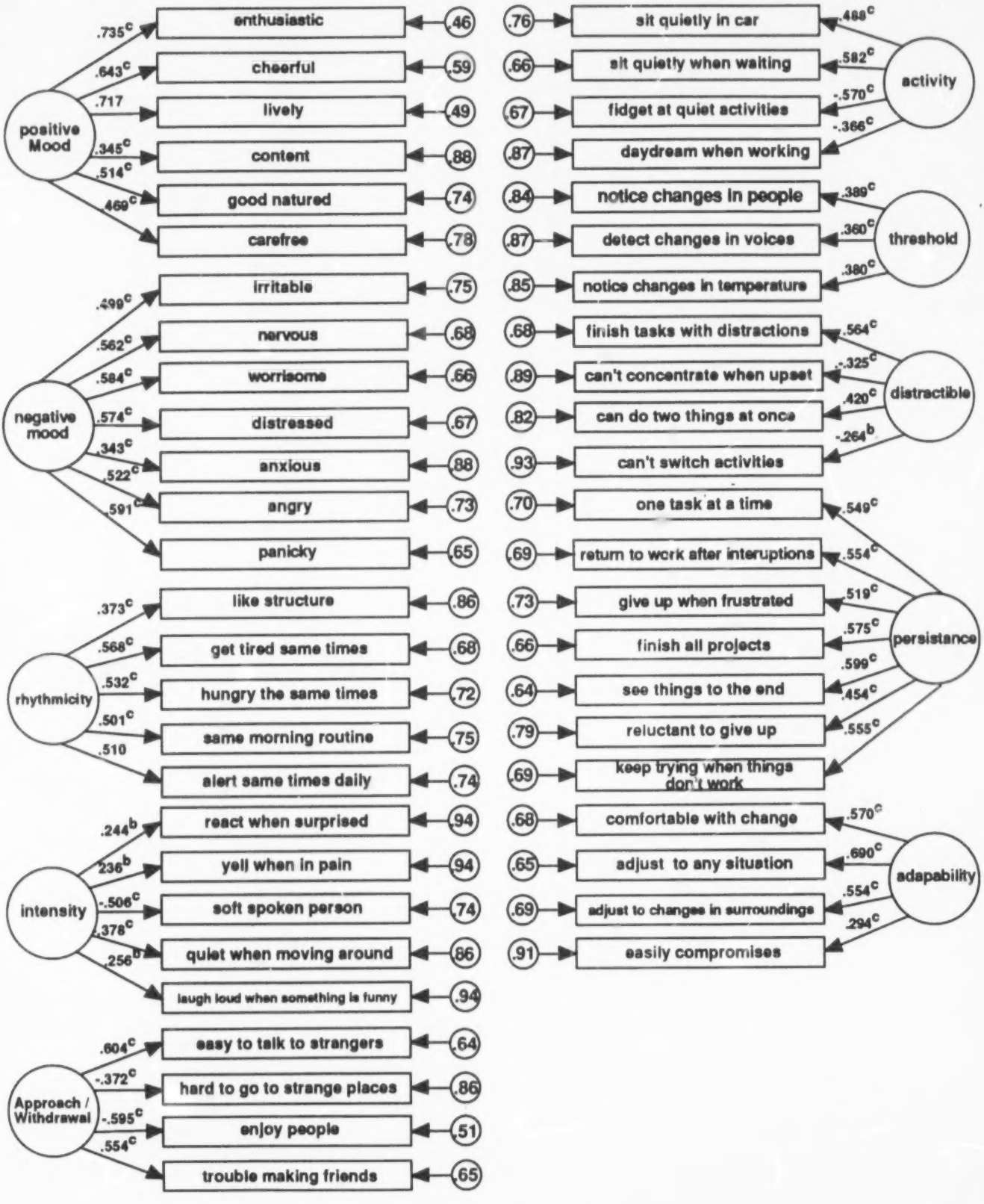
Latent Factor Intercorrelations from the Measurement Model

| | F1 | F2 | F3 | F4 | F5 | F6 | F7 | F8 | F9 | F10 |
|---|---|---|---|---|---|---|---|---|---|---|
| F1 | (.56) | .19a | .36c | .51c | .14a | -.07 | -.69c | .17a | .03 | -.22b |
| F2 | | (.33) | .52c | .50c | .62c | .54c | .18 | .11 | .34c | -.01 |
| F3 | | | (.41) | .85c | .80c | .50c | -.12 | -.08 | .48c | -.30 |
| F4 | | | | (.75) | .54c | .38c | -.24b | .16a | .40c | -.23c |
| F5 | | | | | (.64) | .74c | .13 | -.01 | .67c | -.34c |
| F6 | | | | | | (.66) | .64c | -.06 | .72c | -.32c |
| F7 | | | | | | | (.39) | -.14 | .44c | -.03 |
| F8 | | | | | | | | (.62) | .11 | .10 |
| F9 | | | | | | | | | (.74) | -.33c |
| F10 | | | | | | | | | | (.73) |

Note: Numbers in parentheses are standardized reliability estimates computed by the Werts, Linn, J reskog (1974) method.

LABELS: F1=Activity; F2=Threshold; F3=Distractibility; F4=Persistenc F5=Adaptability; F6=Approach/withdrawal; F7=Intensity; F8=Rhythmicity; F9=Positive mood; F10=Negative mood.

a=$p < .05$; b=$p < .01$; and c=$p < .001$.



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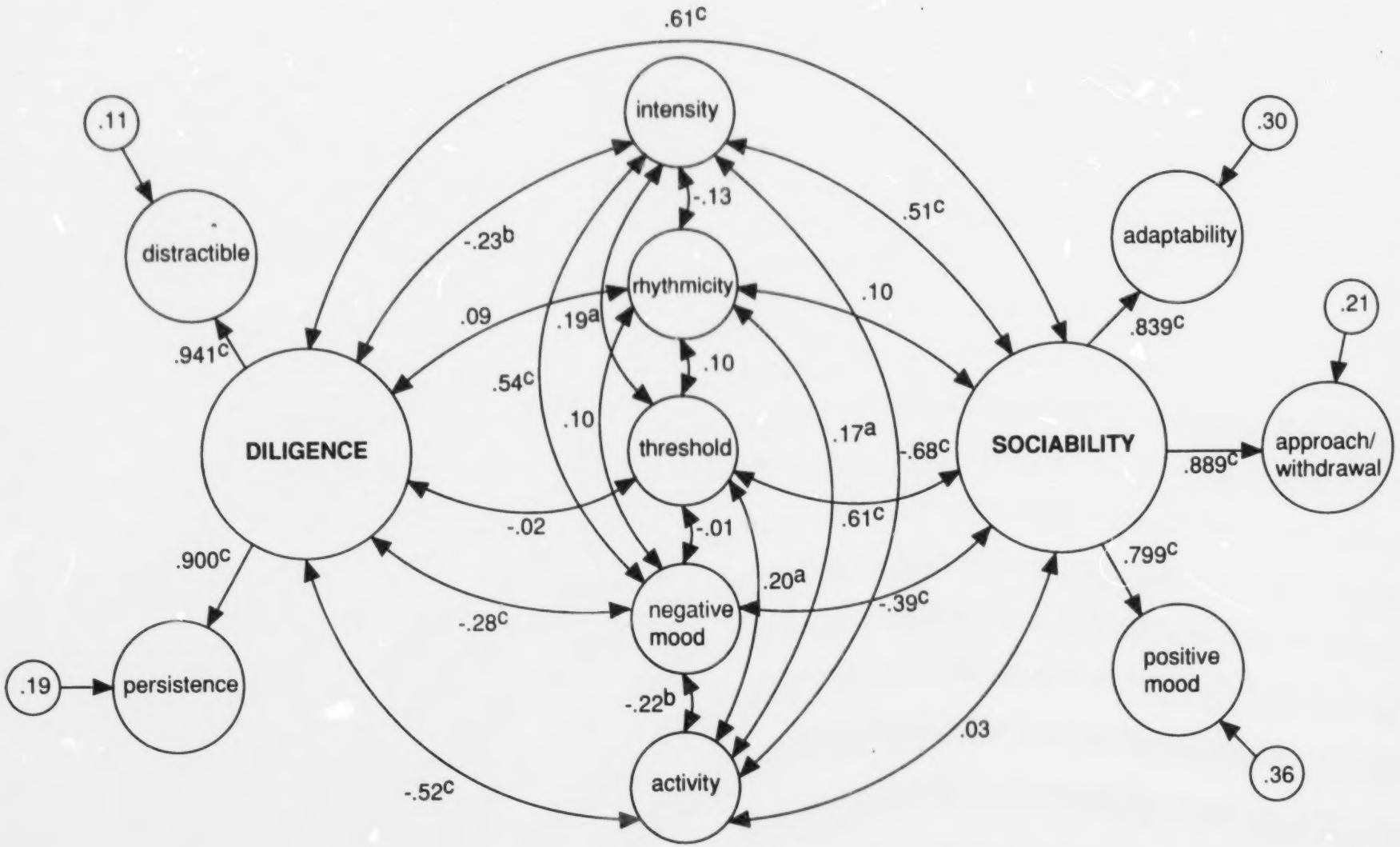
.61c
intensity
.11
.30
distractible
-.13
.51c
adaptability
-.23b
rhythmicity
.10
.09
.19a
.21
.941c
.839c
.54c
.10
.10
.17a
DILIGENCE
threshold
-.68c
SOCIABILITY
approach/
withdrawal
.889c
-.02
-.01
.61c
.900c
.799c
.20a
negative
mood
-.28c
-.39c
positive
mood
.19
persistence
-.22b
.03
activity
-.52c
.36